Forest Health Protection
Pacific Southwest Region

Date: July 13, 2018
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To: Elizabeth Berger, Acting Forest Supervisor, Six Rivers National Forest

Subject: Aker Woods Project, Mad River Ranger District

At the request of Carolyn Cook, Natural Resources Staff Officer, and Dan Dill, District Ranger, a site visit was made to the 1000 Aker Woods Project area twelve miles south of the Mad River Ranger Station on June 25, 2018. This is a Trinity River Collaborative project that is moving forward for FY19 and is in the process of developing the early project footprint.

Background

The initial project area consists of approximately 1,800 acres along the 2S08 road from the boundary of the Lassic Fire of 2015 near Alder Spring in the north southward about eight miles to approximately one mile south of the Zenia Guard Station (Appendix 1). The northern stands consist primarily of mature white fir (*Abies concolor*) within Late Successional Reserve (LSR) moving southward to lower elevation stands of mature Douglas fir (*Pseudotsuga menziesii)* mixed with black oak (*Quercus kelloggii*) with pockets of ponderosa pine (*Pinus ponderosa*), as well as approximately 200 acres of off-site pine plantations to the south of the Zenia Guard Station.

Aerial survey documented fir engraver- and western pine beetle-caused tree mortality (Appendix 1 and 2) in the project area between 2015 and 2017. Evidence of bark beetle activity within the project footprint prompted the District to explore options to see if this project would meet the intent of the Insect and Disease CE category, however, it does not fall within a Farm Bill Insect/Disease Designated Watershed. The District decided a wildlife C.E. would be a better fit within the LSR but still wanted to address the insect and disease issues within the project area.

The project area is designated as LSR to the north and Matrix land allocation to the south. According to the Northwest Forest Plan, LSR are lands reserved for the protection and restoration of late successional old growth forest ecosystems and habitat for associated species including northern spotted owl. Matrix is the federal land outside the categories of other Northwest Forest Plan designated areas in which most timber harvest and other silvicultural activities are conducted. The Forest Plan requires management to maintain tree densities to enhance growth and yield, forest health, and vigor, recognizing the natural role of fire, insects, disease and other components.

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Average conditions in the Mad River area include an average annual temperature of 52.7 degrees F and average annual precipitation of 38 inches falling primarily as rain from October through April.

Observations

The project area focuses on broad areas with slopes < 35% with roadside treatments in the narrow areas with slopes > 35% to facilitate mechanical treatment.

The white fir stands in the north have diameters ranging from 6-30+ inches with basal areas of about 200-250 square feet per acre (Figure 1). The stands are dominated by white fir with a mix of incense cedar (*Calocedrus decurrens*) and Jeffery pine (*Pinus jeffreyi*). There is some evidence of fir engraver beetle (*Scolytus ventralis*) activity throughout especially in suppressed and intermediate canopy trees (Figure 2). There was also some evidence of laminate decay in the down logs, but no *Heterobasidion* conks were found. It was discussed that since the area in within LSR, canopy closure of 60% needs to be

Figure 1. Dense mature white fir stands dominate the northern portion of the project area.

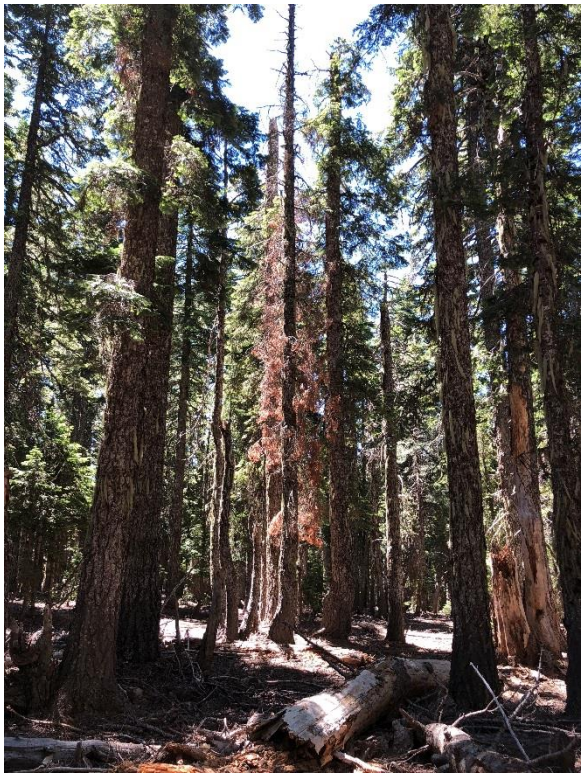


Figure 2. Evidence of fir engraver beetle was found in the codominant crown classes.

maintained and 80 foot buffers will need to be retained around any areas that show annual scour for Riparian Reserves (Figure 3). Thinning to this level will most likely leave a residual basal area of about 160-180 square feet per acre which would reduce the risk of wildfire and allow for residual trees to continue toward old growth characteristics.

Figure 1. Evidence of annual scour indicates a riparian reserve may be required in places.

Moving southward along the road, there are pockets of what appears to be natural ponderosa pine stands. This may indicate changes in the soil parent material or may have been planted at some previous time. These stands are mixed with incense cedar and sugar pine (*P. lambertiana*) and are scattered as far south as Watts Lake Camp Ground. There are pockets of western pine beetle-caused tree mortality in these stands, 5-10 trees affected in each pocket (Figure 4). Thinning to 80-100 square feet per acre would reduce the risk of continued bark beetle-caused tree mortality and retaining sugar pine and other non-pine species would increase diversity.

Figure 4. Western pine beetle-caused pine mortality in mature ponderosa pine stands scattered between the white fir and Douglas fir zones within the project area.

Further south the forest type changes to Douglas fir mixed with black oak and madrone (*Arbutus menziesii*) with scattered ponderosa pine, white fir, incense cedar, and sugar pine. Basal area in these stands ranges about 150-250 square feet per acre with Douglas

fir diameters 6-40+ inches at breast height (Figure 5). Many of the black oaks are or have been overtopped and are started to decline (Figure 6). Discussions centered on bringing the basal area down to about 140 square feet per acre preserving legacy pines and thinning around oaks with large crowns and straight stems to allow the Douglas fir to attain old growth characteristics and create space for oak to grow and regenerate.

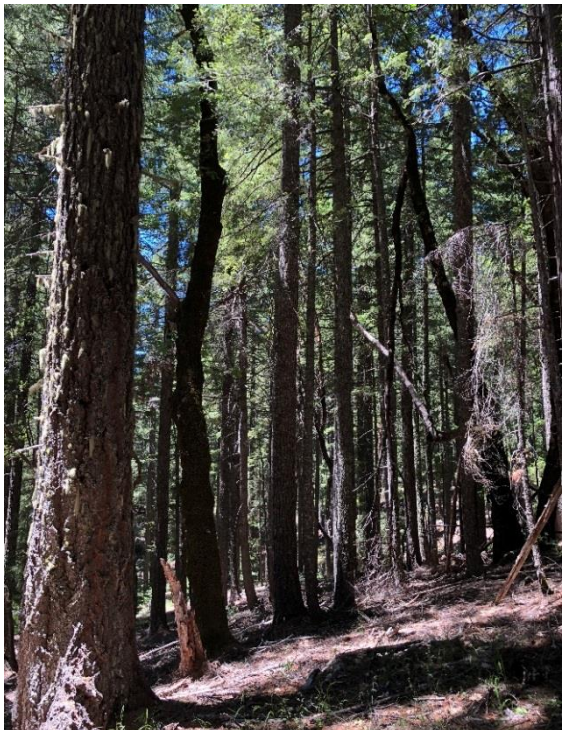


Figure 5. Dense mature Douglas fir stands mixed with black oak and madrone.

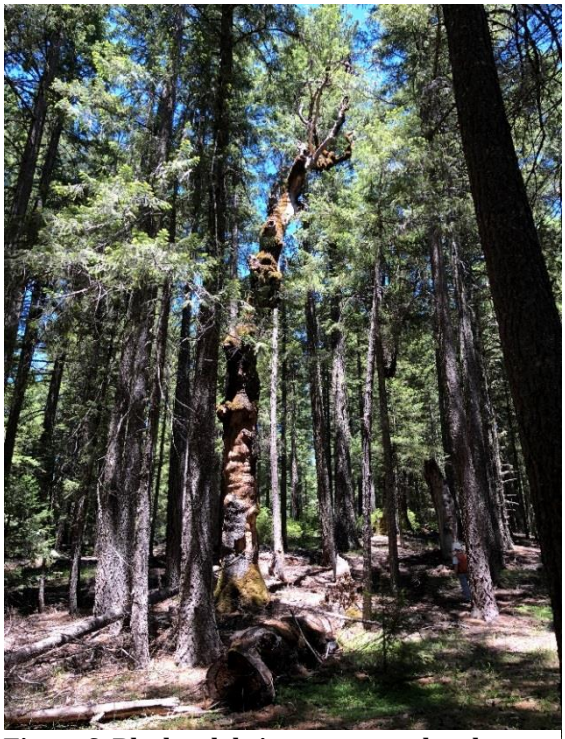


Figure 6. Black oak being overtopped and starting to decline and fall out of the mix of species.

Ponderosa pine plantations make up the far southern portion of the project area near the Zenia Guard Station. Ponderosa pine was planted in the 1960's from an unknown seed source and is thought to be off-site due to the extreme amount of snow damage (Figure 7) not seen in the other pine stands. Basal area of the pine, which averages about 15 inches in diameter, is about 120-200 with an ingrowth of Douglas fir and madrone. The forest floor is thick with native grass such as California fescue. Many of the pines are missing tops or severely deformed by snow damage. *Ips* species are common in the tops. Outside of the plantations, across the parking lot from the guard station, is a stand of ponderosa pine with 8-10 trees killed by western pine beetle (Figure 8). Discussions centered around removing all deformed pines, thinning the remaining pines to 80 square feet per acre, and allowing the Douglas fir to dominate the site with the possibility of creating legacy-sized pine in the overstory. The herbaceous ground cover may interest local deer and turkey clubs to partner in treating these plantations.

Figure 7. Snow-damaged ponderosa pine from unknown seed source, planted in the mid-1960's.

Figure 8. Western pine beetle galleries under the bark of ponderosa pine outside of the Zenia Guard Station.

Discussion

The project is a good step toward improving forest health and increasing resilience to insects and disease across all forest types covered. The white fir and Douglas fir stands would easily produce sawlogs enough to cover the costs of treatment and would not require extra funding from Forest Health Protection. The ponderosa pine plantations around the Zenia Guard Station would not fare as well and would be good candidates for FHP and other partners to provide treatment dollars.

Much of the area has experienced some declines in forest health as seen in the aerial surveys (Appendix 1). Fir engraver beetle has caused mortality in white fir throughout the project area but mostly in the more northern zones where white is dominant. Flatheaded fir borer caused a minor amount of mortality during the height of the latest drought and remains a threat if drought returns to the Douglas fir zone. Western pine beetle was found in the "natural" pine stands between the white fir and Douglas fir zones as well as the pine plantations at the southern zone by Zenia. The area is at risk of continued western pine beetle-caused mortality in ponderosa pine due primarily to overstocking and stress from *Ips* and damage to the crowns. Much of the project footprint is considered highest priority for treatment in the mixed pine stands and second highest treatment prioritization in much of the fir dominated stands based on the RO Treatment Prioritization Map tool (Appendix 3).

As with most bark beetles, the most economical and efficient means of management is to maintain trees and stands in a healthy condition. Stocking reduction and creation of diverse stand conditions would reduce susceptibility to western pine beetle. Discussions

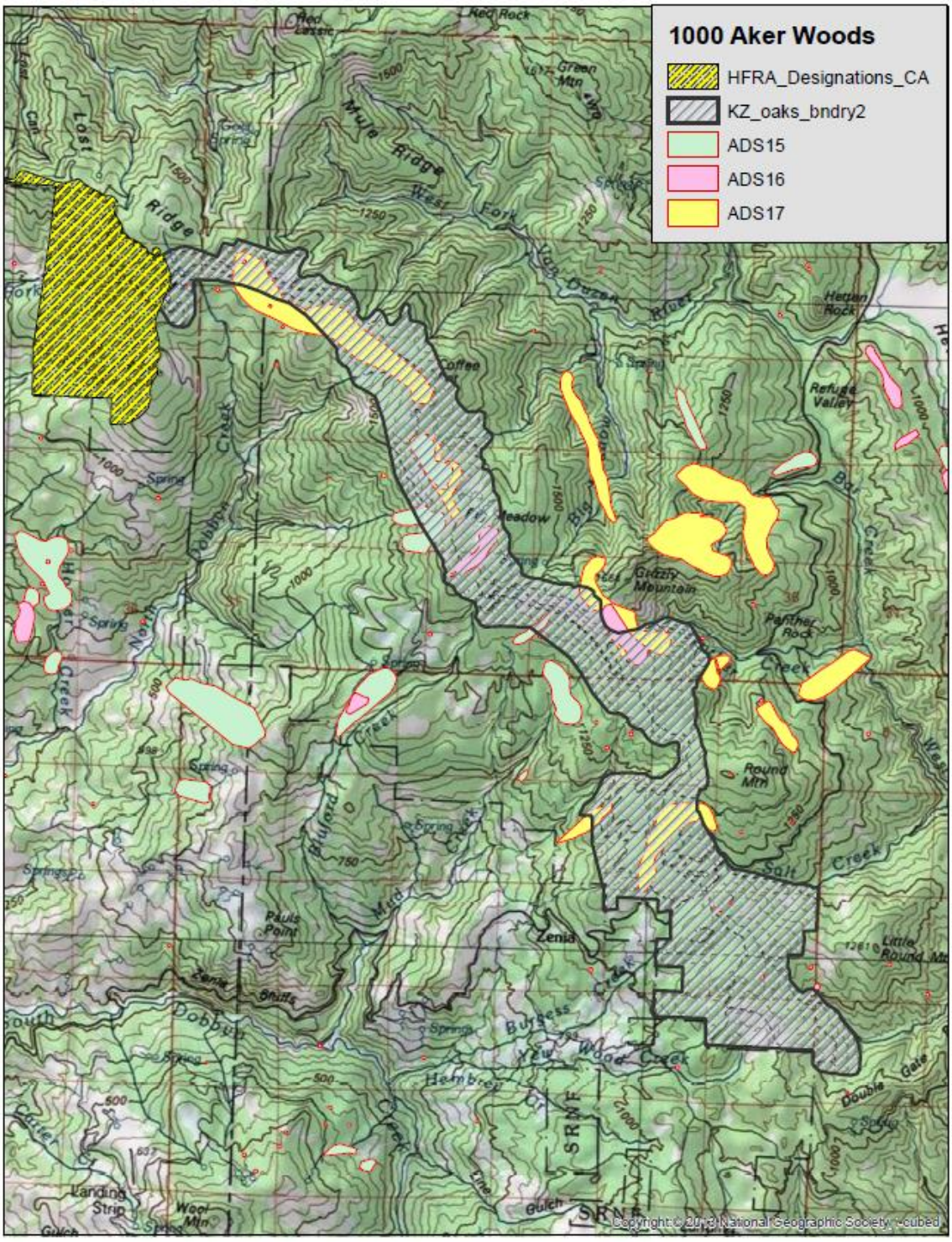
centered on reducing density throughout the project area while maintaining canopy cover in the LSR and increasing species diversity in the pine dominated stands. These actions plus the protection of the hardwood component in the Douglas fir stands would increase residual tree vigor and reduce the risk of continued tree mortality while enhancing and promoting old-growth characteristics of the project area for old growth related species, and enhancing other wildlife values such as mast for deer and turkey.

If you have any questions regarding this report and/or need additional information, please contact Cynthia Snyder at 530-226-2437 or Pete Angwin at 530-226-2436.

/s/ Cynthia Snyder

Cc: Dan Dill, Jeff Jones, Carolyn Cook, Sheri Smith, Chris Fischer, Sherry Hazlehurst, Pete Angwin, Chris Losi

Appendix 1 - Location.



Map of Aker Woods boundary in relation to HFRA High Hazard Tier 2 boundary and tree mortality polygons mapped during aerial surveys 2015-2017.

Appendix 2 – Insects and disease present.

Fir engraver beetle (*Scolytus ventralis*) is a medium-sized bark beetle, measuring about 5 mm in length. It is the largest of the shiny black Scolytus beetles and is recognized by the concave abdomen typical of the genus. Fir engravers are a major mortality agent of true firs, usually attacking pole-sized to sawtimber-sized trees. Trees under attack are not always easily recognized, although sometimes boring dust will be evident on their bark. Often, successfully infested trees cannot be differentiated from uninfested trees until the year after attack when their foliage turns red.

The fir engraver completes one generation per year. Adult beetles fly and initiate new attacks between June and September, with peak flight activity in July and August. Females initiate attacks and after mating, construct an egg gallery perpendicular to the grain of the tree. Eggs are laid on both sides of this gallery and larval galleries are parallel to the grain on both sides of the egg gallery. Both the egg and larval galleries deeply score the wood. Larvae hatch within two weeks. Winter is passed in the late larval or pupal stage, and young adults mature by the following summer.

The fir engraver is a key mortality agent for firs under stress. By killing trees, the fir engraver increases diversity in a stand and creates habitats for numerous organisms that depend on dead wood. Engravers also colonize down material and hasten its recycling by introducing wood decay fungi through the bark. As opportunists, these beetles often kill trees affected by root diseases or stressed by other insects. Sublethal attacks resulting in top-kill are also common. Fir engraver outbreaks have primarily occurred on dry fir sites (characterized by 20-25" of annual precipitation) during periods of drought.

Since the majority of endemic fir engraver populations are associated with root diseases, the management of these disease pockets will also serve to manage the fir engraver. Stand thinning measures in fir stands generally do not seem to yield the same benefits that are seen with pines. Residual firs are easily damaged during harvest activities and are sensitive to soil compaction, often making them even more susceptible to fir engravers after treatment than before. The large-scale outbreaks associated with drought conditions can best be managed by reducing the occurrence of the fir host on dry sites. Once an outbreak begins, sanitation/salvage appears to result in little or no population reduction of fir engravers.

References:

Furniss, R.L., and Carolin, V.M. 1977. Western forest insects. USDA Forest Service Miscellaneous Publication 1339. 654 p.

Western pine beetle (*Dendroctonus brevicomis*) is the smallest of the western *Dendroctonus* species, this black cylindrical beetle is about the size of a grain of rice (4 mm in length). Its hosts include only ponderosa and Coulter pines. Egg galleries are winding and packed with frass. Larval galleries lead away from the main gallery for short distances before turning into the outer bark. Small, reddish pitch tubes (sometimes fairly obscure) are signs of successful attack. Attacked trees often exhibit woodpecker feeding with only portions of the outer bark removed. Sapwood of infested trees usually shows evidence of the characteristic bluestain associated with the fungi introduced by the attacking beetles.

Successful attacks result in death of the host tree. Occasionally, groups of trees are killed, especially when growing under crowded conditions. Since larger trees are generally preferred, the western pine beetle can dramatically alter the character of a forest that comes under attack. Effects on specific resources can include loss of timber volume, an increase in fire potential and impacts to other species dependent on large live trees.

In the northern part of its range and at higher elevations, the western pine beetle completes two widely overlapping generations in one year, with peak adult flights in early June and late August. In the southern part of its range and at lower elevations, the beetles produce three and sometimes four generations per year. Attacks may be as early as March and as late as November. Female beetles locate a suitable host and initiate attacks by burrowing through the bark. They release an airborne chemical that attracts other beetles and leads to concentrated attacks on the host tree. These beetle-produced attractants can lead to mass attacks on several trees in a group. Each female lays about 60 eggs in individual niches cut in the sides of the egg gallery. These eggs hatch in two weeks and young larvae feed initially in the phloem, later moving into the middle bark where most of their development takes place. After four larval stages, the insects turn into pupae and then adults.

The western pine beetle breeds most commonly in trees of reduced vigor. While older, larger trees are generally preferred, younger trees can also be infested, especially when they occur in dense stands, are infected by pathogens, or are damaged by fire. During periods of drought, the western pine beetle will be particularly prominent and can overcome healthy trees as well.

The detrimental effects of western pine beetle can best be minimized by providing vigorous growing conditions for the host trees. Stand densities below the "Upper Management Zone" (Cochran 1992; Cochran et al 1994) will provide sufficient growing space for trees and will minimize potential habitat for the western pine beetle. *Dendroctonus* beetle group-kills cause a limiting Stand Density Index of 365 that differs little between stands on good and poor sites in California (Oliver 1995).

References:

Cochran, P. H. 1992. Stocking levels and underlying assumptions for uneven-aged ponderosa pine stands. USDA Forest Service Pacific Northwest Research Station Research Note PNW-RN-509. 10 p.

Cochran , P. H., Geist, J.M., Clemens, D.L., Clausnitzer, R.R., and. Powell, D.C. 1994. Suggested stocking levels for forest stands in northeastern Oregon and Washington.

USDA Forest Service, Pacific Northwest Research Station. Research Note PNW-RN-513. 21 p.

DeMars, C.J., Jr., and Roettgering, B.H. 1982. Western pine beetle. USDA Forest Service Forest Insect & Disease Leaflet 1. 8 p.

Miller, J. M. and Keen, F.P. 1960. Biology and control of the western pine beetle. USDA Misc. Publication 800. 381 p.

Oliver, W. W. 1995. Is Self-Thinning in Ponderosa Pine Ruled by *Dendroctonus* Bark Beetles? In: Eskew, Lane G. (comp.) Proc. 1995 Natl. Silviculture Workshop; Gen. Tech. Rep. RM-GTR-267. 246 p.

Appendix 3. Treatment Prioritization Map Tool